Charles Darwin University

Final Examination

Family Name						
Given Name/s						
Student Number						
Teaching Period	Semester 1 Special, 2018					

ENG412 – Road and Traffic Engineering	DURATION	
	Reading Time:	10 minutes
	Writing Time:	120 minutes

INSTRUCTIONS TO CANDIDATES

Answer all questions.
There are two sections to the exam paper.
Marks for each section is indicated at the head of each section
If necessary, make appropriate assumptions and sate your assumptions.
Total marks for this examination is 100.

EXAM CONDITIONS

<u>You may begin writing from the commencement of the examination session.</u> The reading time indicated above is provided as a guide only.

This is a CLOSED BOOK examination

Any non-programmable calculator is permitted

No handwritten notes are permitted

No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	1 x 16 Page Book 1 x Scrap Paper

THIS EXAMINATION IS PRINTED DOUBLE-SIDED.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

SECTION A (Each question worth 4 Marks)

Attempt all questions.

1. Explain the Approach Sight Distance (ASD) and Safe Intersection Sight Distance (SISD)
2. Explain the concept of “equivalent standard axle”.
3. Explain the difference in the purpose of using Flux and Cutter.
4. Explain Open graded Asphalt mix and its application.
5. What is the difference between Flexible and Rigid pavement. Sketch the different layers you will find in the cross section for each pavement.
6. What are the application of Prime and Primeseals in sprayed seal treatment.
7. Explain the steps involved in gravel resheeting.
8. Explain catch drain and table drain in surface drain.
9. Recent bitumen surfacing work in an area shows a history of poor affinity between binder and aggregate. Provide some recommendations to overcome the problem.
10. Discuss how corrugated surface of a gravel road can be rectified.

SECTION B (Each question is worth 20 Marks)

Attempt all questions

1. Testing reveals a subgrade of California Bearing Ratio (CBR) = 5.0
Design is required for a bituminous sealed urban road. Assume Nature of road – Dual carriageway urban freeway

AADT (Year) – 18,000 (5years ago)

Percent HV – 7%

Growth rate – 5%

Design period in years – 20

Assume 50/50 split and urban arterial

Assume each direction of flow has 2 lanes and 80% of heavy vehicles carried by heavy vehicle lane.

Given: g = 1.2, ESA = 1.8, CGF = 30

Limitations on the designs are:

Minimum thickness of any layer is 100 mm.

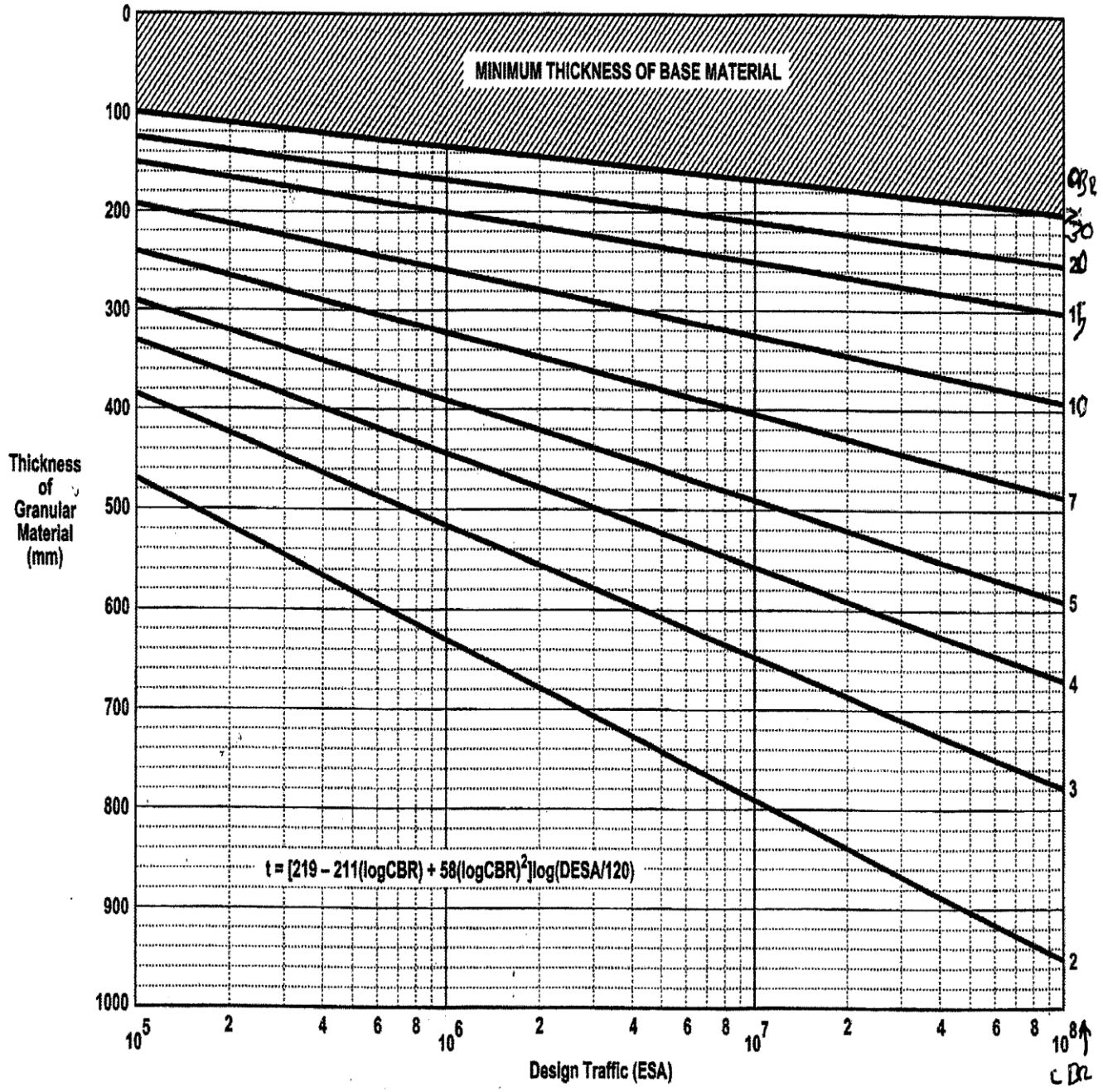
Thickness of stabilised layer 200 mm.

Materials available see below.

Materials available	**CBR**	**Cost/m^3 ($)**
Base course	80	70
Sub base	45	50
Selected fill	20	30
Stabilised sub grade material	15	25

Determine the most economical design using the empirical method

Given design traffic (N_{DT}) = Opening ESA/day x365xCGF

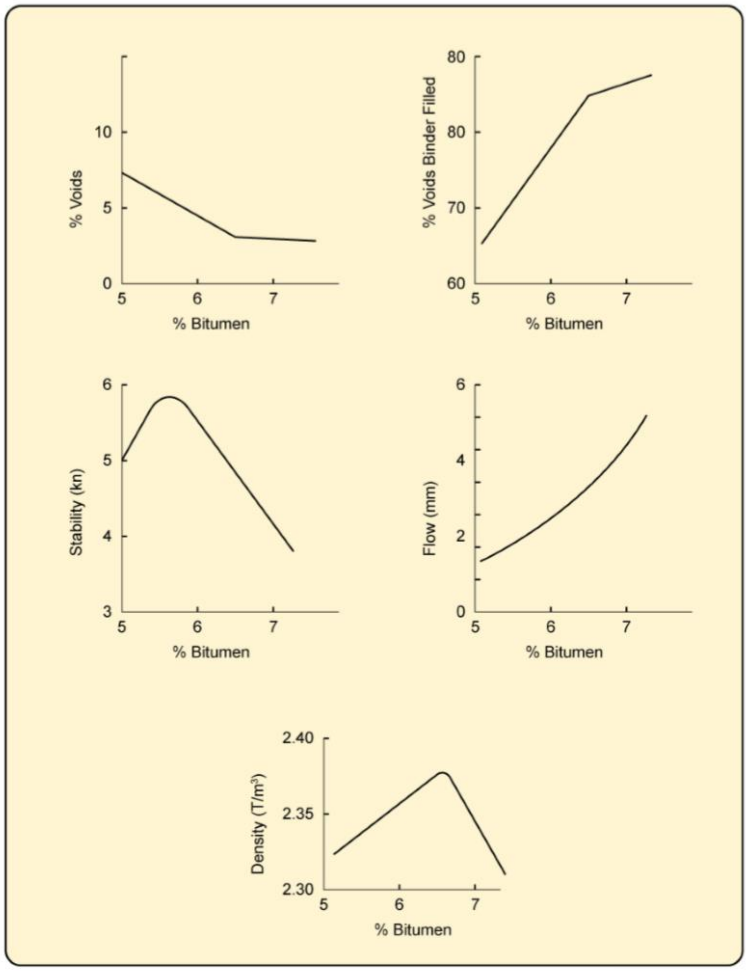


(Chart from Austroads Manual)

2. A hot-mixed dense-graded, bituminous concrete is required to meet the following specification.

Specification		
Property	**Min.**	**Max.**
Stability (KN)	5	-
Flow(mm)	2	3.5
Air Voids (%)	4	7
Voids binder Filled (%)	65	80

Trial mixes have been produced and tested. The results are presented in graphical form on the following page. Determine: the optimum binder content. Explain how you selected a particular optimum binder value and give reasons for your selection.



3. The two grades of a sag vertical curve are – 4% and +2%, the curve commencing at chainage 200 at RL 26.050 and having a length of 300 m. A large circular concrete pipe drain is situated at right angles to the road with its centre line at chainage 350.

The drain has an invert level at this chainage of RL 20.080, the diameter is 1800 mm, and the thickness of concrete at the crown is 75 mm. If the drain requires a minimum cover above the top of the pipe of 0.750 m, will it have to be lowered, and if so by how much?